

HAWTHORN (*CRATAEGUS*, ROSACEAE) DATA FOR THE FLORA OF THE NORTH HUNGARIAN MOUNTAINS (NE HUNGARY)

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Abstract: This paper includes 4 hawthorn species (*C. laevigata*, *C. lindmanii*, *C. ovalis*, *C. rosaeformis* subsp. *rosaeformis*) and 8 hawthorn hybrid taxa (*C. ×macrocarpa* nothosubsp. *baranecii*, *C. ×media*, *C. ×plagiosepala* nothosubsp. *dunensis*, *C. ×pseudoxyacantha*, *C. ×radnoti-gyarmatii*, *C. subsphaerica* nothosubsp. *jacquinii* and nothosubsp. *subsphaerica*) from the North Hungarian Mountains, giving the exact location data and site conditions of the new discoveries. It points out that approximately 10% of the hawthorn individuals in the studied forests are microspecies or hybrids, and that hybrid taxa are often present more frequently than their parent species.

Key words: Bükk Mts, Cserhát Mts, distribution, floristic data, hybrids, Mátra Mts, microspecies, Putnok Hills

INTRODUCTION

In Hungary, in addition to the most common hawthorn taxa (*Crataegus monogyna*, *C. laevigata*) we have rather few distribution data of other taxa. My goal is to expand this data. My work is related to the Hungarian (e.g. BARANEC and KERÉNYI-NAGY 2008, KERÉNYI-NAGY and NAGY 2011, MALATINSZKY 2015, VIRÓK *et al.* 2016, MOLNÁR 2016, NAGY 2019) and Carpathian Basin and Central European (e.g. KARÁCSONYI 1995, KUHN and MÁTIS 2017, NEGREAN and KARÁCSONYI 2017, OKLEJEWICZ *et al.* 2015, SCHMIDT 2015, SOŁTYS-LELEK *et al.* 2013, 2016) research that has intensified in the recent years, and remarkably contributed to the clarification of the exact distribution of these taxa.

MATERIALS AND METHODS

In 2020, during the work of the “Life 4 Oak Forests” project, I conducted a detailed forest condition survey in several forests of the North Hungarian Mountains. I measured all trees and shrubs of the appropriate size in a radius of 9–20 m around the points of the pre-selected triangular-based sampling mesh. I

examined nearly 600 points from spring to autumn, but only the time of ripening is suitable for the accurate determination of hawthorns, so I omitted a number of uncertain data. I also added data from some field trips for other purposes to this list. In addition to the common *C. monogyna* and *C. laevigata* individuals, several microspecies and hybrids have been found.

A herbarium and photo documentation of the identifiable specimens were prepared. The herbarium will be placed in the Hungarian Natural History Museum, Botanical Department (BP), the photo documentation can be found at the author. The determination of taxa was based on the monograph of KERÉNYI-NAGY (2015), taking into account the works of BARANEC (1986). The collected material was revised by Viktor Kerényi-Nagy. The identification was based on morphological characters.

In the Enumeration the observed specimens are listed. The nomenclature follows the work of KERÉNYI-NAGY (2015), but in each case I also give the most important synonyms, mainly based on CHRISTENSEN (1992). This is followed by the exact occurrence data with topographic name and coordinates in WGS 84 system, the relevant CEU code, the time of the observation, the characteristic habitat, and then the significance of the occurrence is explained in Hungarian. If a herbarium has been prepared for the specimen, the abbreviation of the hosting herbarium (BP) is indicated.

RESULTS AND DISCUSSION

In my experience, I found the two most common species (*Crataegus monogyna*, *C. laevigata*) most often in the sample areas studied in the North Hungarian Mountains, approximately 90%. The remaining 10% of hawthorn individuals belong to one of the microspecies or hybrids. However, only about one-tenth of these were definable, that is, they had fruits. The lack of fruits can be explained by wild chewing, unfavourable spring weather, changes in forest structure, degree of canopy level closure, distance from the ecological optimum of this taxon, and the fact that hybrids have presumably less flowering and even less fruit producing ability (CHRISTENSEN 1992). The most common of these is a hybrid of two large species (*Crataegus* \times *media*). Furthermore, 3 species (*C. lindmanii*, *C. ovalis*, *C. rosaeformis* subsp. *rosaeformis*) and 7 hybrid taxa (*C.* \times *macrocarpa* nothosubsp. *baranecii*, *C.* \times *plagiosepala* nothosubsp. *dunensis*, *C.* \times *pseudoxyacantha*, *C.* \times *radnoti-gyarmatii*, *C. subsphaerica* nothosubsp. *jacquinii* and nothosubsp. *subsphaerica*) were collected.

Typically, hybrids are more common, or even exclusive, than the parental microspecies in a given forest. The same was found in southern Poland by

OKLEJEWICZ *et al.* (2013) and in Hungary by KERÉNYI-NAGY (2015). The phenomenon is explained by the strong anthropogenic impact on forests, which increased the likelihood of different taxa meeting, and the areas became increasingly overlapping. In several cases, I encountered further transitions of the observed hybrids towards *C. monogyna*, less frequently *C. laevigata*, which were not clearly distinguishable from the one-seeded and midland hawthorn (e.g. SOŁTYS-LELEK *et al.* 2013). I have classified these individuals as large species and these are not listed in this work.

ENUMERATION

Crataegus laevigata (Poir.) DC.

Bükk Mts: Kerecsend: Kerecsendi forest. 8287.2 CEU.

Previous literature indicates only the occurrence of *C. monogyna* from the forest (SZUJKÓ-LACZA 1984, ZÓLYOMI *et al.* 2013), although approximately a quarter of hawthorns are *laevigata*, or hybrids. The Atlas Florae Hungariae already indicated it from the square (flora mapping data of A. Schmotzer – BARTHA *et al.* 2021).

It is common in forests and forest edges in the North Hungarian Mountains.

Crataegus lindmanii Hrab.-Uhr. var. *extrasepala* Kerényi-Nagy, Baranec, Bartha
/ var. *kovatsii* Kerényi-Nagy

syn. *C. curvisepala* Lindm. subsp. *lindmanii* (Hrab.-Uhr.) Byatt; *C. rosaeformis* Janka subsp. *lindmanii* (Hrab.-Uhr.) Christensen; *C. rhipidophylla* Gand. var. *lindmanii* (Hrab.-Uhr.) Christensen; *C. rhipidophylla* Gand. var. *ronnigeri* (K. Malý) Janjić

Mátra Mts: Pásztó–Mátrakeresztes: Nagy-rétek. Several plants, N47.89500° E19.81136, 8184.2 CEU, 2020.10.06. – In bushy abandoned meadow.

Bükk Mts: Cserépfalu: Perpác. One plant, N47.96260° E20.53536°, 8089.1 CEU, 2020.08.01. (BP) (Fig. 1). – In the old part of *Quercetum petraeae-cerris*, consisting of large trees, partly on the edge of a natural, partly artificial gap. About 4 m high, with 1 main and 4 thinner trunks.

KERÉNYI-NAGY (2014) wrote in detail about the species. In Hungary it is first mentioned by GOSTYŃSKA-JAKUSZEWSKA and HRABĚTOVÁ-UHROVÁ (1983), but no exact locality was given. The first accurate location data were published by KERÉNYI-NAGY *et al.* (2011) from the Vértes Mts and Börzsöny Mts – very



Fig. 1. *Crataegus lindmanii* in Perpác, near Cserépfalu.

large populations are known in the latter mountains (NAGY 2019, HASZONITS *et al.* 2021) – and then from the Visegrád Mts (KERÉNYI-NAGY 2012). Nearest place in the Bükk Mts, next to Három-kő, near Répáshuta (KERÉNYI-NAGY and SZTUPÁK 2012).

Potentially endangered species, Natura2000 marker and recommended for protection (KERÉNYI-NAGY and PENKSZA 2015), as well as an endangered species in the Carpathian part of Slovakia (Eliáš, P. in TURIS *et al.* 2014).

Crataegus × *macrocarpa* Hegetschw. nothosubsp. *baranecii* Kerényi-Nagy
(= *C. laevigata* (Poir.) DC. × *C. lindmanii* Hrab.-Uhr. × *C. rosaeformis* Janka)

Mátra Mts: Mátraszentimre-Fallóskút: Hegyes Mountain. One plant, N47.90423° E19.83456°, 8085.3 CEU, 2020.08.16. (BP). – A younger shrub lives in a completely wooded part of a former wooded meadow, in a *Quercus-Carpinetum* habitat.

The nothosubsp. is known in the Buda Mts, and Visegrád Mts (BARANEC and KERÉNYI-NAGY 2008), as well as in the Börzsöny Mts, and Bükk Mts (KERÉNYI-NAGY 2015).

Crataegus ×media Bechst.

(= *C. laevigata*(Poir.) DC. × *C. monogyna* Jacq.)

Cserhát Mts: Buják: Bokri Mountain, Község erdője 8083.3 CEU;
Mátraszőlős: Kiss-Függő-kő, forests along Szamár-patak 8083.2, 8084.1 CEU.

Mátra Mts: Mátraszentimre-Fallóskút: Hegyes Mountain 8085.3 CEU.

Bükk Mts: Cserépfalu: Karácson tisztása, Perpác 8089.1 CEU; Felsőtárkány:
Miklós-völgy 8088.1, 8088.2, 8088.4 CEU; Kerecsend: Kerecsendi forest 8287.2 CEU.

Putnok Hills: Gömöraszőlős: Egerdő-tető, Csató-bérc, Szeles-kert 7688.1, 7688.2 CEU.

Frequent. Where both parent species are present, they usually appear.

Crataegus ovalis Kit.

Cserhát Mts: Mátraszőlős: courtyard of the Vöröskő Mine. One plant, N47.96092° E19.67811°, 8084.1 CEU, 2020.08.27. (BP) (Fig. 2). – A 2.5 m high, spacious bush lives on an artificial surface, inside the closed yard of the mine.

Mátra Mts: Mátraszentimre-Fallóskút: Hegyes Mountain. One plant, N47.90383° E19.83444°, 8085.3 CEU, 2020.08.16. (BP). – A tall middle-aged



Fig. 2. *Crataegus ovalis* in Vöröskő Mine, near Mátraszőlős.

shrub lives in a completely wooded part of a former wooded meadow, it lives in an *Quercetum petraeae-cerris* and *Quercus-Carpinetum* transitional site.

Its wider environment is inhabited by hybrids showing a transition to *C. monogyna*.

Perhaps an indigenous taxon of the Carpathian Basin with very few known occurrence data. It was collected by KERÉNYI-NAGY (2010, 2012) from the Budai Mts, by KERÉNYI-NAGY and NAGY (2011) from the Börzsöny Mts, near Kemence, and by Virók (VIRÓK *et al.* 2016) next to Aggtelek. Several populations are known in the Felvidék (now Slovakia), as well as one in Transcarpathia (now Ukraine) and one in Transsylvania (now Romania).

According to KERÉNYI-NAGY and PENKSZA (2015), it is a critically endangered species that is a Natura2000 marker and recommended for protection.

Crataegus × *plagiosepala* Pojark. nothosubsp. *dunensis* (Cin.) Kerényi-Nagy
(= *C. lindmanii* Hrab.-Uhr. × *C. monogyna* Jacq. × *C. rosaeformis* Janka
subsp. *rosaeformis*)

Cserhát Mts: Mátraszőlős: forests along Szamár-patak. One plant, N47.97303° E19.67021°, 8084.1 CEU, 2020.08.22. (BP) (Fig. 3). – In middle-aged *Quercetum petraeae-cerris*.



Fig. 3. *Crataegus* × *plagiosepala* nothosubsp. *dunensis* in forest along Szamár-patak, near Mátraszőlős.

Mátra Mts: Mátraszentimre-Fallóskút: Hegyes Mountain. One plant, N47.90190° E19.83218°, 8085.3 CEU, 2020.07.16. (BP). – It is partially forested on a former wooded meadow, on a *Quercus-Carpinetum* site, but lives under a more open canopy.

The species was indicated by KERÉNYI-NAGY and NAGY (2011) from Kemence in the Börzsöny Mts.

Crataegus × *pseudoxyacantha* Cin.

(= *C. laevigata* (Poir.) DC. × *C. rosaeformis* Janka subsp. *curvisepala* (Lindm.) Kerényi-Nagy)

syn. *C. xuhrovae* Soó

Bükk Mts: Felsőtárkány: Miklós-völgy. One plant, N47.94865° E20.41770°, 8088.4 CEU, 2020.07.27. (BP). – In the former *Aceri tatarico-Quercetum*, which is slowly turning into a *Quercetum petraeae-cerris*.

It was collected from the Közös forest of Beregdaróc by Simon and Jakucs (KERÉNYI-NAGY and PENKSZA 2019), then from Pilisborosjenő by KERÉNYI-NAGY (2012), and from Szögliget and Aggtelek by KERÉNYI-NAGY and VIRÓK (2017).

Crataegus × *radnoti-gyarmatii* Kerényi-Nagy

(= *C. monogyna* Jacq. × *C. ovalis* Kit.)

Mátra Mts: Mátraszentimre-Fallóskút: Hegyes Mountain. Several plants, N47.90171° E19.83359°, 2020.07.17. (BP); N47.90281° E19.83488°, N47.90209° E19.83449°, N47.90221° E19.83488°, N47.90221° E19.83362°, N47.90304° E19.83709°, N47.90319° E19.83631°, 8085.3 CEU, 2020.08.27–29. (Fig. 4). – Formerly utilised as a wooded meadow or pasture, now wooded and mostly *Corno-Quercetum*, *Quercetum petraeae-cerris*, possibly *Quercus-Carpinetum*, there are many small trees, or shrubs, usually 1–4 trunks and 4–6 m high.

Mátraszentimre-Fallóskút: village interior. One plant, N47.90875° E19.84686°, 8085.3 CEU, 2020.07.17. (BP). – In a mowed indoor lawn, an undeveloped area is inhabited by an approx. 4 m high, spacious, single-stemmed large bush.

The recently described hybrid taxon from Vöröskővár of Budapest (KERÉNYI-NAGY 2015), which has since been found in other parts of Budapest and in Szilágy County, Transsylvania (KARÁCSONYI *et al.* 2016).



Fig. 4. *Crataegus xradnoti-gyarmatii* in Hegyes Mountain, near Mátraszentimre-Fallóskút.



Fig. 5. *Crataegus rosaeformis* subsp. *rosaeformis* in Perpác, near Cserépfalu.

Crataegus rosaeformis Janka subsp. *rosaeformis*

syn. *C. rhytidophilla* Gand.

Bükk Mts: Cserépfalu: Perpác. Several plants, e.g. N47.96096° E20.53604°, 2020.07.01. (BP); N47.96089° E20.53565°, N47.96095° E20.53574°, N47.96094° E20.53571°, N47.96119° E20.53521°, 8089.1 CEU, 2020.08.01. (Fig. 5) – In more closed *Quercus pubescens* forest, in abandoned and forested pasture forest. Stout shrubs, small trees, 4–5 m high, with a trunk circumference of up to 20 cm in height, usually with 1, sometimes 2–4 shoots per stem. Its wider environment is inhabited by hybrids showing a transition to *C. monogyna*.

It can be found throughout the Transdanubian Mountains and the North Hungarian Mountains, although the population is probably partly isolated (KERÉNYI-NAGY and PENKSZA 2015). Nearby to the Aggtelek karst it was collected by Sz. Priszter and several other data are known from the part of the Gömör–Torna karst that now belongs to Slovakia (VIRÓK *et al.* 2016). MOLNÁR (2016) indicated it from the Cserehát, and it was collected by Fóris in the Bükk Mts near Diósgyőr (KERÉNYI-NAGY 2015), and in other places of the Bükk Mts (KERÉNYI-NAGY and SZTUPÁK 2012).

Natura2000 marker and species recommended for protection (KERÉNYI-NAGY and PENKSZA 2015).

Crataegus × *subsphaerica* Gand. nothosubsp. *jacquinii* (Kerner ex Pénzes)

Kerényi-Nagy (= *C. monogyna* Jacq. × *C. rosaeformis* Janka subsp. *curvisepala* (Lindm.) Kerényi-Nagy)

syn. *C. monogyna* Jacq. subsp. *jacquinii* Kerner ex Pénzes

Bükk Mts: Felsőtárkány: Miklós-völgy. One plant, N47.94862° E20.41742°, 8088.4 CEU, 2020.07.27. (BP). – It lives in a more closed, transforming *Aceri tatarico-Quercetum*. 2.5 m high, 1 trunk small tree.

It is known primarily from the collections of PÉNZES (1956) from the Transdanubian and North Hungarian Mountains, as well as from the Kiskunság, Nyírség, and from the Mecsek Mts.

Crataegus × *subsphaerica* Gand. nothosubsp. *subsphaerica*

(= *C. monogyna* Jacq. × *C. rosaeformis* Janka subsp. *rosaeformis*)

syn. *C. ×silicensis* Baranec

Cserhát Mts: Mátraszőlős: forests along Szamár-patak and Kis-Függő-kő. Several plants, N47.97469° E19.66541° (BP), N47.97280° E19.67024°, N47.97348° E19.66912°, N47.97327° E19.66937°, N47.96979° E19.66727°, N47.96669° E19.66869°, N47.96605° E19.66710°, 8083.2, 8084.1 CEU, 2020.08.20–26. – In forests once heavily used by peasants and they are regenerating today into *Quercetum petraeae-cerris*.

Mátra Mts: Mátraszentimre-Fallóskút: Hegyes Mountain. Several plants, N47.90305° E19.83746°, N47.90329° E19.83674°, N47.90339° E19.83678°, N47.90351° E19.83542°, 8085.3 CEU, 2020.08.27–29. – Abandoned and forested wooded meadows in the parts of *Quercetum petraeae-cerris* and *Quercus-Carpinetum* areas.

Bükk Mts: Cserépfalu: Perpác and Hór Valley side, e.g. in front of the Suba-lyuk cave. Among the parent species. Several plants, e.g. N47.96114° E20.53063° (BP), N47.96087° E20.53555°, N47.96123° E20.53556°, N47.96159° E20.53557°, 8089.1 CEU, 2020.07.01.–08.01. (Fig. 6). – In *Corno-Quercetum* groves and former pastures that are now becoming *Quercus pubescens* forest.

Although one of the most frequently identified hawthorn hybrids, KERÉNYI-NAGY (2015) did not write its data within the current border of Hungary, only indicated the Felvidék (now Slovakia).



Fig. 6. *Crataegus* ×*subsp. sphaerica* nothosubsp. *subsp. sphaerica* in front of the Suba-lyuk Cave, near Cserépfalu.

Crataegus ×waloekochiana (Hrab.-Uhr.) P. A. Schmidt
(= *C. laevigata* (Poir.) DC. × *C. lindmanii* Hrab.-Uhr.)

Mátra Mts: Mátraszentimre-Fallóskút: Hegyes Mountain. One plant, N47.90390° E19.83453°, 8085.3 CEU, 2020.08.16. (BP). – In former meadow, now young *Quercus-Carpinetum* forest.

Pásztó–Mátrakeresztes: Nagy-rétek. Several plants, N47.89489° E19.81084° and N47.89503° E19.81116°, 8184.2 CEU, 2020.10.06. – In bushy abandoned meadow.

Recsk: Hosszú. Several plants, N47.92298° E20.08513°, 8086.4 CEU, 2020.10.06. – In bushy abandoned arable land that is now grazed.

It is known in the Balaton Uplands, the Buda Mts and Visegrád Mts, Börzsöny Mts and Bükk Mts (KERÉNYI-NAGY 2012, 2015) and near Jósvalő (KERÉNYI-NAGY and VIRÓK 2017).

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Összefoglalás: Galagonya (*Crataegus*, Rosaceae) adatok az Északi-középhegység flórájához. A tanulmány 4 galagonyafaj (*C. laevigata*, *C. lindmanii*, *C. ovalis*, *C. rosaeformis* subsp. *rosaeformis*) és 8 galagonya hibrid taxon (*C. ×macrocarpa* nothosubsp. *baranecii*, *C. ×media*, *C. ×plagiosepala* nothosubsp. *dunensis*, *C. ×pseudoxyacantha*, *C. ×radnoti-gyarmatii*, *C. subsphaerica* nothosubsp. *jacquinii* és nothosubsp. *subsphaerica*) új elterjedési adatait mutatja be az Északi-középhegység területéről, megadva az új előkerülés pontos helyadatait és termőhelyi körülményeit. Felhívja a figyelmet, hogy a vizsgált erdőkben a galagonya egyedek hozzávetőlegesen 10%-a valamelyik kist faj, vagy hibrid, illetve hogy a hibrid taxonok gyakran nagyobb arányban vannak jelen, mint szülő(kis) fajaik.

REFERENCES

- BARANEC, T. (1986): Biosystematické štúdium rodu *Crataegus* L. na Slovensku. – *Acta Dendrobiologica* 11: 1–118.
- BARANEC, T. and KERÉNYI-NAGY, V. (2008): Galagonya-taxonómia és galagonya élőhelyek a Kárpát-medencében. – *Kitaibelia* 13(1): 95.
- BARTHA, D., BÁN, M., SCHMIDT, D. and TIBORCZ, V. (2021): Magyarország edényes növényfajainak online adatbázisa (<http://floraatlasz.uni-sopron.hu>). – Soproni Egyetem, Erdőmérnöki Kar, Növényteni és természetvédelmi Intézet.
- CHRISTENSEN, K. I. (1992): Revision of *Crataegus* Sect. *Crataegus* and *Nothosect. Crataeguineae* (Rosaceae-Maloideae) in the Old World. – *Systematic Botany Monographs* 35: 1–199.
- GOSTYŃSKA-JAKUSZEWSKA, M. and HRABĚTOVÁ-UHROVÁ, A. (1983): Distribution of *Crataegus* species in Poland and Czechoslovakia. – *Preslia* 55: 9–24.

- HASZONITS, GY., MOLNÁR, CS., SONKOLY, J., TÓTHMÉRÉSZ, B., TÖRÖK, P., TÓTH, E., GNOTEK, P., NAGY, J., KORDA, M., ÁDÁM, SZ., MALATINSZKY, Á., REIZING, N., JÓNA, Z. and SÉLLEI, D. (2021): Pótlások Magyarország edényes növényfajainak elterjedési atlaszához XIII. – *Kitaibelia* **26**(1): 85–88. <https://doi.org/10.17542/kit.26.85>
- KARÁCSONYI, C. (1995): *Flora și vegetația județului Satu Mare*. – Editura Muzeului Sătmărean, Satu Mare, 196 pp.
- KARÁCSONYI, K., NEGREAN, G., SZATMARI, P.-M., PENKSZA, K. and KERÉNYI-NAGY, V. (2016): *A Radnóti-Gyarmati-galagonya Szilágy (Sălaj) megyében (Erdély, Románia)*. – XI. Aktuális Flóra- és vegetációkutatás a Kárpát-medencében nemzetközi konferencia, Budapest, pp. 162–163.
- KERÉNYI-NAGY, V. (2010): Piros átermésű ritka galagonya fajok. – *Crataegus* spp. – *Tilia* **15**: 75–111.
- KERÉNYI-NAGY, V. (2012): *Újabb adatok Budapest és környékének rózsza- és galagonyaismeretéhez*. – Előadaskötet, A Magyar Biológiai Társaság XXIX. Vándorgyűlése. pp. 103–108.
- KERÉNYI-NAGY, V. (2014): Nomenclature, taxonomy and distribution of *Crataegus lindmanii*. – *Acta Bot. Hung.* **56**(3–4): 331–341. <https://doi.org/10.1556/ABot.56.2014.3-4.9>
- KERÉNYI-NAGY, V. (2015): *A Kárpát-Pannon és Illír régió vadon termő galagonyáinak monográfiája – A monograph of hawthorns of Carpat-Pannon and Illyr regions*. – Szent István Egyetem, Egyetemi Kiadó, Gödöllő, 323 pp.
- KERÉNYI-NAGY, V., BARANEC, T. and BARTHA, D. (2011): *A Lindman-galagonya és a szárlkás egybibés galagonya Mo-on*. – Előadaskötet, VII. Kárpát-medencei Biológiai Szimpózium, Magyar Biológiai Társaság, Budapest, pp. 91–96.
- KERÉNYI-NAGY, V. and NAGY, J. (2011): *Adatok a Börzsöny hegység galagonya és rózsafajához*. – Előadaskötet, VII. Kárpát-medencei Biológiai Szimpózium, Magyar Biológiai Társaság, Budapest, pp. 139–144.
- KERÉNYI-NAGY, V. and PENKSZA, K. (2015): Javaslatok a NATURA2000 jelölőfajok bővítésére – közösségi jelentőségű rózsza- és galagonyafajok. – *Gyepgazdálkodási Közlemények* **13**(1–2): 3–15.
- KERÉNYI-NAGY, V. and PENKSZA, K. (2019): *Eötvös Loránd Tudományegyetem Füvészkerti herbáriumának (BPU) rózsza (Rosa spp.) és galagonya (Crataegus spp.) adatai*. – In: KERÉNYI-NAGY, V., GYURICZA, CS., ESTÓK, J., PALKOVICS, L., LAKATOS, T. and BÉRES, A. (eds): Konferencia-kötet, III. Rózsza- és galagonyakutatás a Kárpát-medencében, pp. 179–196.
- KERÉNYI-NAGY, V. and SZTUPÁK, M. (2012): *Rózsza és galagonyaadatok a Bükk flórájához*. – Előadaskötet, Magyar Biológiai Társaság XXIX. Vándorgyűlése, Budapest, pp. 93–97.
- KERÉNYI-NAGY, V. and VIRÓK, V. (2017): *Rózsza és galagonya adatok Borsod-Abaúj-Zemplén megye északi részének flórájához*. – In: KERÉNYI-NAGY, V., GYURICZA, CS., ESTÓK, J., MEZŐSZENTGYÖRGYI, D., LAKATOS, T., POSTA, K. and PENKSZA, K. (eds): Konferencia-kötet, II. Rózsza- és galagonyakutatás a Kárpát-medencében, pp. 263–266.
- KUHN, T. and MÁTIS, A. (2017): *Galagonya és rózsza adatok Románia és Bulgária flórájához*. – In: KERÉNYI-NAGY, V., GYURICZA, CS., ESTÓK, J., MEZŐSZENTGYÖRGYI, D., LAKATOS, T., POSTA, K. and PENKSZA, K. (eds): Konferencia-kötet, II. Rózsza- és galagonyakutatás a Kárpát-medencében, pp. 243–244.
- MALATINSZKY, Á. (2015): (17) *Crataegus rosaeformis* Janka subsp. *curvisepala* (Lindm.) Kerényi-Nagy (Rosaceae). – In: BARINA, Z., BENEDEK, L., BOROS, L., DIMA, B., FOLCZ, Á., KIRÁLY, G., KOSZKA, A., MALATINSZKY, Á., PAPP, D., PIFKÓ, D. and PAPP, V.: Taxonomical and chorological notes 1. – *Studia bot. hung.* **46**(2): 214. <https://doi.org/10.17110/StudBot.2015.46.2.205>

- MOLNÁR, Cs. (2016): Rózsaképzű galagonya (*Crataegus rosaeformis* Janka subsp. *rosaeformis*) a Cserehátban. – *Apró közlemények – Kitaibelia* **21**(2): 257–260.
<https://doi.org/10.17542/kit.21.257>
- NAGY, J. (2019): *Adatok a Lindman-galagonya (Crataegus lindmanii Hrab.-Uhr.) cönológiai karakterének ismeretéhez.* – In: KERÉNYI-NAGY, V., GYURICZA, Cs., ESTÓK, J., PALKOVICS, L., LAKATOS, T. and BÉRES, A. (eds): Konferencia-kötet, III. Rózsa- és galagonyakutatás a Kárpát-medencében, pp. 203–211.
- NEGREAN, G. and KARÁCSONYI, C. (2017): *Genus Crataegus, Florae Planitiae Transtibiscentis, pars Romaniae.* – In: KERÉNYI-NAGY, V., GYURICZA, Cs., ESTÓK, J., MEZŐSZENTGYÖRGYI, D., LAKATOS, T., POSTA, K. and PENKSZA, K. (eds): Konferencia-kötet, II. Rózsa- és galagonyakutatás a Kárpát-medencében, pp. 16–29.
- OKLEJEWICZ, K., CHWASTEK, EU., SZEWCZYK, M., BOBIEC, A. and MITKA, J. (2013): Distribution of *Crataegus* (Rosaceae) in S-E Poland along a gradient of anthropogenic influence. – *Pol. J. Ecol.* **61**(4): 683–691.
- OKLEJEWICZ, K., SZEWCZYK, M. and WOLANIN, M. (2015): Rodzaj *Crataegus* w Bieszczadach. – *Roczniki Bieszczadzkie* **23**: 55–70.
- PÉNZES, A. (1956): Galagonya (*Crataegus*)-tanulmányok. – *A Kertészeti és Szőlészeti Főiskola Évkönyve (Annales Academiae Horti- et Viticulture)* **2**(1): 107–137.
- SCHMIDT, P. A. (2015): *The genus Crataegus L. (Rosaceae) in Germany: a short survey.* – In: KERÉNYI-NAGY, V., SZIRMAI, O., HELYES, L., PENKSZA, K. and NEMÉNYI, A. (eds): Konferencia-kötet, I. Rózsa- és galagonya-konferencia a Kárpát-medencében, pp. 47–54.
- SOŁTYS-LELEK, A., BARABASZ-KRASNY, B., TURIS, P. and TURISOVÁ, I. (2013): The genus *Crataegus* L. in the western part of the buffer zone of the Low Tatras National Park (Slovakia), in accordance with recent morphological and systematic recognition. – *Modern Phytomorphology* **3**: 19–24.
- SOŁTYS-LELEK, A., BARABASZ-KRASNY, B., TURIS, P. and TURISOVÁ, I. (2016): Chorológia niektorých taxónov kritických rodov *Crataegus* L. a *Rosa* L. vo vybraných častiach Národného parku Nízke Tatry. Časť 5. – *Naturae Tutela* **20**(1): 5–19.
- SZUJKÓ-LACZA, J. (1984): The flora of the Kerecsendi berek forest. – *Studia bot. hung.* **17**: 23–39.
- TURIS, P., KLIMENT, J., FERÁKOVÁ, V., DÍTĚ, D., ELIÁŠ, P., HRIVNÁK, R., KOŠŤÁL, ŠUVADA, R., MRÁZ, P. and BERNÁTOVÁ, D. (2014): Red List of vascular plants of the Carpathian part of Slovakia. – *Thaiszia* **24**(1): 35–87.
- VIRÓK, V., FARKAS, R., FARKAS, T., ŠUVADA, R. and VOJTKÓ, A. (2016): *A Gömör–Tornai-karszt flórája. Enumeráció.* – Aggteleki Nemzeti Park Igazgatóság, Jászvafő, 922 pp.
- ZÓLYOMI, B., HORVÁTH, A., KEVEY, B. and LENDVAI, G. (2013): Steppe woodlands with tatarian maple (*Aceri tatarici-Quercetum pubescentis-roboris*) on the Great Hungarian Plain and its neighbourhood. An unfinished synthesis with supplementary notes. – *Acta Bot. Hung.* **55**(1–2): 167–189. <https://doi.org/10.1556/abot.55.2013.1-2.11>

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